NON-PUBLIC?: N
ACCESSION #: 9011210263
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Arkansas Nuclear One, Unit Two PAGE: 1 OF 4

DOCKET NUMBER: 05000368

TITLE: Automatic Reactor Trip Due to an Erroneous Control Element Assembly Position Indication and Subsequent Penalty Factor Generated by the Control Element Assembly Calculator
EVENT DATE: 06/26/90 LER #: 90-014-01 REPORT DATE: 11/13/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 030

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At about 2348 hours on June 26, 1990, a reactor trip occurred from approximately thirty percent of rated thermal power on low Departure from Nucleate Boiling Ratio. The cause of the reactor trip was attributed to an erroneous indication received by Control Element Assembly Calculator (CEAC) #1 from Reed Switch Position Transmitter (RSPT) #1 on a part length Control Element Assembly (CEA 29). A large penalty factor was calculated by CEAC #1 and resulted in the generation of a reactor trip signal from the Core Protection Calculators (CPCs). The root cause of the high indication has not been determined. A temporary modification was installed for CEA 29, RSPT #1 which provided a fixed signal for the CEA at a full out value. The safety function of the CEA was unaffected with the temporary modification installed. Training was provided to the operations staff responsible for the approach to criticality.

Additionally, appropriate procedure revisions were made and a caution card installed on the control panel to address placing CEAC #1 in an inoperable condition if the part length CEAs were going to be inserted. Placing CEAC #1 in an inoperable condition blocks any CEA position signals sent to the CPCs and thereby, prevents an unnecessary reactor trip. The CEAC/CPC systems functioned as designed, and the reactor trip resulted in all CEAs fully inserting. Therefore, there were no safety concerns.

END OF ABSTRACT

A. Plant Status

At the time of occurrence of this event, Arkansas Nuclear One, Unit Two (ANO-2) was operating at approximately thirty percent of rated thermal power. Reactor Coolant System (RCS) AB! pressure was approximately 2250 psia and RCS average temperature about 556 degrees Fahrenheit.

B. Event Description

On June 26, 1990, at approximately 0046 hours, reactor power level was reduced from 100 percent of rated thermal power to approximately one percent power to repair a non-isolable leak on a turbine control valve drain line. After repairs were completed, reactor power level was increased to about thirty percent and stabilized to hold for steam generator (SG) SG! water chemistry to be restored to acceptable limits.

At about 2335 hours on June 26, 1990, SG water chemistry was restored to acceptable limits and preparations were made to commence a power increase to 100 percent of rated thermal power. At about 2348 hours, a reactor trip occurred on low Departure from Nucleate Boiling Ratio (DNBR). When the reactor Trip Circuit Breakers (TCBs) opened, the Control Element Assemblies (CEAs) fully inserted into the reactor core. Immediately following the reactor trip, the Control Room Operators performed the immediate actions of the Emergency Operating Procedure. There were no equipment malfunctions noted as a result of the reactor trip.

The Control Element Assembly Calculators (CEACs) monitor the positions of four CEAs in a subgroup and generate a penalty factor if a CEA in the subgroup deviates from the other CEAs by more than a predetermined value. The generated penalty factor is sent to the

Core Protection Calculators (CPCs) where it is utilized in the DNBR and Local Power Density (LPD) calculations and will generate a reactor trip signal.

Position indication for each CEA is provided by three sources, two Reed Switch Position Transmitters (RSPTs) and a pulse counter. There are two CEACs, RSPT #1 supplies CEAC #1 and RSPT #2 supplies CEAC #2. Since June 9, 1990, a Control Room alarm had annunciated several times indicating the position signal for a part length CEA (CEA 29) was occasionally indicating high (i.e., spiking) although the actual CEA position was unchanged. An investigation by Instrumentation And Control (I&C) technicians indicated that the source of the erroneous spiking was most likely located in the circuitry inside the reactor containment building.

While holding power at thirty percent, the part length CEAs were partially inserted into the reactor core to assist in controlling Axial Power Shape Index (AST) associated with xenon oscillations. Just prior to the reactor trip the Control Room alarm annunciated indicating CEA 29 had spiked high. As designed the CEAC generated a penalty factor that was sent to the CPSs where a low DNBR condition was calculated which resulted in a reactor trip. The plant was returned to Mode 1 (Power Operations) and operated until a planned shutdown on July 13, 1990.

C. Root Cause

The cause of the reactor trip was attributed to a large penalty factor generated by CEAC #1 and input into the CPCs where a reactor trip signal was generated. The penalty factor was generated by a perceived large deviation between CEA 29 and the other CEAs when the position indication for CEA 29 spiked high.

On July 13, 1990, a plant shutdown to Mode 5 (Cold Shutdown) for a scheduled maintenance outage on unrelated equipment was performed. While in Mode 5, the RSPT connectors for CEA 29 were inspected and a loose connection was found. Attempts were made with the loose connection to recreate the spiking condition that had previously been observed, however, were unsuccessful. The root cause of the erroneous indication could not be determined. The #1 RSPT and cabling from the reactor head through the containment building for CEA 29 were replaced. The original RSPT and cabling will be further tested to attempt to identify the root cause of the erroneous indication.

As a contributing factor, operability of RSPT #1 on CEA 29 and its input to CEAC #1 was not considered for any plant conditions other than full power and all CEAs withdrawn. (i.e., a plant condition which require the part length CEAs to be partially inserted into the reactor core was not considered.) An outward deviation with the CEAs fully withdrawn would not result in the same system response as an outward deviation with the CEAs partially inserted.

D. Corrective Actions

As a result of the occasional spiking of CEA 29, prior to the reactor trip on June 26, 1990, actions had been initiated to install a temporary modification. The temporary modification would provide a continuous fixed signal for CEA 29 from RSPT #1 to CEAC #1 at a full out value approximately 150 inches withdrawn. This modification would prevent the Control Room alarm from annunciating, and prevent CEAC #1 from sensing the erroneous spiking indications. The part length CEA would still perform its safety function, id a reactor trip signal were received. Monitoring the actual position of CEA 29 was still available utilizing the redundant RSPT and the pulse counter. The temporary modification was installed on June 27, 1990, prior to returning the unit to power operation.

Prior to the reactor startup following the reactor trip, training was provided to the operating crew responsible for performing the approach to criticality. The training provided instructions to place CEAC #1 in an inoperable condition prior to inserting the part length CEAs, if needed to ASI control. Placing CEAC #1 in an inoperable condition would block any signal that the CEAC calculated from being sent to the CPCs and thereby, prevent an unnecessary reactor trip. A caution card was placed on the CEA control panel in the Control Room and appropriated procedures revised to provide the Control Room operators with an additional reminder of the need to place CEAC #1 in an inoperable condition prior to inserting the part length CEAs into the reactor core for ASI control.

The condition reporting procedure was revised on April 15, 1990, to note the importance of considering different operational conditions. The procedure will be further revised by January 15, 1991, to provide additional clarification concerning the need to consider different operational conditions.

When 100 percent power operation is achieved following the

maintenance outage, RSPT #1 of CEA 29 will be monitored to verify proper operation. If the RSPT operates correctly, the temporary modification will be removed.

E. Safety Significance

The CEACs are designed to protect the plant against single CEA deviation events within symmetric subgroups. The CPCs are designed to protect the plant against CEA group and subgroup deviation events.

This event, although a reactor trip occurred, did not result in any significant safety concerns. there was not an actual CEA deviation during this event, only an erroneous position indication signal. At the time of the reactor trip, all CEAs fully inserted into the reactor core and plant systems responded normally. The CEASE/CAP systems performed as designed. There were, therefore, no safety concerns related to this event.

F. Basis for Reportability

This event is reportable pursuant to 10CFR50.73(A)(2)(iv), as an automatic actuation of an Engineered Safety Feature (ESF), i.e., Reactor Protection System. On June 27, 1990, at approximately 0040 hours, the NRC was notified via the ENS of the automatic reactor trip pursuant to 10CFR50.72(b)(2)(ii).

G. Additional Information

There have been no previously reported similar events.

A supplementary report will be provided if the root cause of high indications on RSPT #1 for CEA 29 can be identified.

Energy Industry Identification Systems (EIIS) codes identified in the text as XX!.

ATTACHMENT 1 TO 9011210263 PAGE 1 OF 1

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November 13 1990

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U. S. Nuclear Regulatory Commission
Document Control Desk
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Washington, D. C. 20555

SUBJECT: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Licensee Event Report No. 50-368/90-014-01

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), attached is the subject report concerning an automatic reactor trip due to an erroneous Control Element Assembly position indication and subsequent penalty factor generated by the Control Element Assembly Calculator. This report is being supplemented to provide a revised schedule for completion of corrective actions.

Very truly yours,

James J. Fisicaro
Manager, Licensing

JJF/LAT/sgw
Attachment

cc: Regional Administrator
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